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J. B. TUCKER

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RATCHET OPERATING MECHANISM

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Fig. 1.

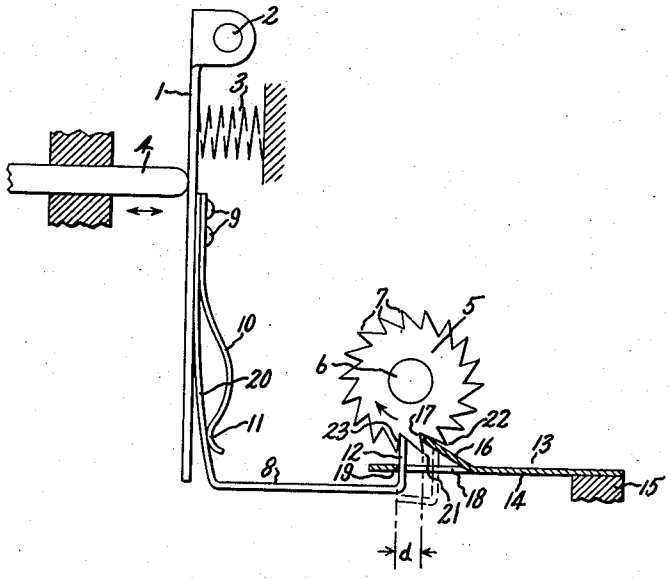
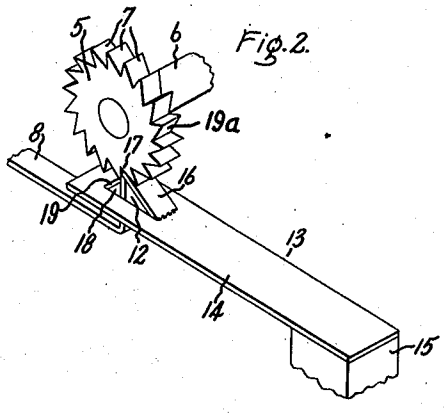



Fig. 2.




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## RATCHET OPERATING MECHANISM

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9 Claims. (Cl. 74—152)

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My invention relates to ratchet operating mechanisms and, more particularly, to arrangements for engaging and limiting the movement of the ratchet element of such mechanisms.

Many control devices employ ratchets which are actuated progressively by the engagement of some moving element with the ratchet. It is usually desirable to advance the ratchet only one tooth at a time so that, for example, the mechanism to be controlled will be operated after a predetermined number of actuations of the ratchet. Such an arrangement necessitates that the ratchet actuating mechanism move the ratchet only the distance of one tooth during each cycle, and, that in returning to re-engage and advance the ratchet, it then engage the next adjacent tooth. By my invention, I have incorporated in a single member portions or elements for engaging the ratchet to prevent reverse movement thereof, for insuring that the ratchet advancing element in reverse movement moves backwardly only one tooth, and for providing a stop to limit the advance or forward movement of the ratchet advancing element to a distance equal to one tooth.

It is an object of my invention to provide an improved arrangement for actuating a ratchet and for positively limiting the amount of movement for each actuation thereof.

It is another object of my invention to provide an improved structure for use with a ratchet, which structure acts as a stop for the ratchet, limits the forward movement of a ratchet advancing element to a predetermined amount and insures engagement of the ratchet advancing element with a particular tooth of the ratchet.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed thereto and forming part of this specification.

In carrying out the objects of my invention, a flat metal strip is stamped to provide an inclined tongue for engaging a ratchet to prevent rotation thereof. A ratchet advancing member extends through the opening resulting from the bending of the tongue from the plane of the strip and engages the ratchet. The edge of the opening provides a stop for limiting the movement of the ratchet advancing member in a forward direction, and the tongue prevents the ratchet-engaging mechanism, during any over travel in a reverse direction, from engaging any tooth other than the next adjacent rearward tooth.

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For a better understanding of my invention, reference may be had to the accompanying drawing in which Fig. 1 is a schematic representation showing an embodiment of my invention; and Fig. 2 is an isometric view of a portion of the mechanism of Fig. 1.

It will be apparent as the following description proceeds that the mechanism of my invention may be employed in many devices. For example, it may readily be incorporated in a refrigerator control wherein defrosting is initiated after a predetermined number of actuations of the ratchet. For purposes of illustration, however, I have indicated only the essential elements of the structure and have shown a force-applying element only in general form. Referring now to the drawing, there is shown a control mechanism including an arm 1 pivoted for a movement about a pin 2. The arm 1 is viased in a clockwise direction by spring 3 and is moved against the bias of this spring 3 by a force-applying element 4. In practice, the force-applying element 4 may, for example, be the ordinary bellows of a conventional refrigerator control which expands and contracts with changes in temperature to move the arm 1.

It may be desirable to cause some particular operation to occur after a predetermined number of cycles of the force-applying element 4; for example, it may be desirable to cause defrosting of the evaporator of a refrigerator after the determined number of cycles of operation. To cause such a periodic operation, suitable mechanism may be actuated by a ratchet which is moved once during each cycle of movement of the force-applying element 4. In the form illustrated, this ratchet is shown as a ratchet wheel 5 mounted on a shaft 6. The ratchet wheel 5 includes a plurality of teeth 7 adapted to be engaged for effecting movement of the ratchet wheel. The movement of the ratchet wheel 5 in a clockwise direction is effected by a ratchet-advancing or rotating member 8. The member 8 is in the form of a bent resilient strip which is secured to the arm 1 by rivets 9 or other suitable fastening devices. In order to permit the member to be made of lighter material so that it will have a low spring constant in the vertical direction and can ride easily over the teeth of the ratchet wheel, a stiffener 10 is also mounted on the arm 1 by the rivets 9 and includes a curved portion 11 engaging the member 8. This stiffener biases the member 8 in a direction toward the arm 1, that is, in a direction to the left in the drawing. The member 8 includes an upwardly

extending portion 12 at the free end thereof for engaging the teeth 7 of the ratchet wheel 5. It can be seen that as the portion 12 of the member 8 is moved toward the left during the retracting or leftward moving portion of the cycle of the force-applying element 4, the ratchet wheel 5 is moved in a clockwise direction, as indicated by the arrow. The movement of the force-applying element 4 and, hence, of the arm 1, is at least equal to an amount necessary to result in the advancing of the ratchet wheel 5 by one tooth.

Regardless of variations in the amount of travel of the force-applying element 4 above the predetermined amount referred to above, it is desirable to insure that the ratchet wheel 5 is advanced only by the amount of one tooth and further to insure that the member 8 in movement toward the right, which may be regarded as its reverse movement as opposed to its advancing movement in rotating the ratchet wheel 5, can result in the portion 12 engaging only the next rearward tooth. I have provided for incorporation in a single stop member elements for accomplishing these purposes and also for engaging the ratchet wheel 5 to prevent a reverse rotation thereof. The stop member 13 is formed from a flat metal strip 14 mounted on a stationary member 15. A first portion or tongue 16 is lanced from the body of the strip 14 and is bent upwardly into a position inclined with respect to the plane of the strip 14 and also inclined with respect to the direction of movement of the ratchet-advancing or rotating member 8 and its ratchet engaging portion 12. The stop member 13 is positioned relative to the ratchet wheel 5 so that the end 17 of the tongue or pawl 16 engages at all times one of the teeth 7 of the ratchet wheel 5 to prevent reverse, or counterclockwise, rotation of the ratchet wheel 5. The upwardly extending portion 12 of the ratchet-advancing member 8 passes through the opening 18 resulting from the bending of the pawl 16 out of the plane of this strip 14. The left hand edge 19 of the opening 18 provides an element or stop portion for engaging the upwardly extending portion 12 of the resilient ratchet-advancing member 8 to limit the movement of this member and its ratchet-engaging portion 12 to the left. Because of the stop provided by the edge 19, the leftward movement of the ratchet-engaging portion 12 is positively limited, regardless of the amount of retraction of the force-applying member 4 so that the ratchet wheel is advanced only one tooth by the leftward movement of the ratchet-advancing member 8. As indicated previously, the ratchet-advancing member 8 is formed of a resilient strip so that, even though the arm 1 may move a greater distance to the left, the portion 20 of the ratchet-advancing member 8 moves away from the arm 1 and the upwardly extending portion 12 remains in engagement with the edge 19 in the position shown. Since the upwardly extending portion 12 of the member 8 passes through the opening 18, the side edges of this strip prevent sidewise movement of the portion 12 and, hence, prevent it from slipping axially from the ratchet wheel.

Even though the leftward movement of the upwardly extending ratchet-engaging portion 12 is limited because of its engagement with the stop provided by the edge 19 of the opening 18, it would still be possible for the ratchet wheel 5 to be advanced more than one tooth, if, because of substantial overtravel of the force-applying element 4 and, hence, of the arm 1, the ratchet-



engaging upwardly extending portion 12 were to move to the right by a distance equal to two or more teeth on the ratchet wheel 5. Such an occurrence, however, is also prevented by the construction of the stop member 13. Thus, the pawl 16 bent up from the plane of the strip 14 is inclined, as mentioned above, relative to the direction of movement of the ratchet-advancing member 8. Accordingly, should the ratchet-engaging portion 12 move to the right by a greater distance than necessary to pass the tip of the tooth indicated at 21, it rides along the surface of the pawl or tongue 16 and it is impossible for the portion 12 to pass into engagement with the next rearward tooth indicated at 22. Such a condition of overtravel is illustrated by the dotted lines in Fig. 1 where it can be seen that the portion 12 merely rides along the surface of the inclined pawl 16 and is blocked from engagement with the tooth indicated at 22 or any more rearward tooth by the intervening pawl 16. When the arm 1 again moves to the left, the portion 12 merely rides down along the inclined pawl 16, engages the tooth indicated at 21, and moves to the left until its further movement is limited by the stop provided by the edge 19, at which time the ratchet wheel 5 has been advanced by one tooth. The stop member 13 is constructed so that the distance *d* between the tip 17 of the pawl 16 and the ratchet engaging end of the portion 12 or the edge 19 of the opening 18 is substantially equal to the distance between adjacent teeth of the ratchet wheel 5, the distance *d* being measured between lines extending through the tip 17 and the edge 19 generally perpendicular to the toothed face 19*a* of the ratchet wheel 5, or more explicitly perpendicular to a line tangent to the ratchet wheel 5 in the area of engagement by the tip 17 and the surface 23 of the upwardly extending portion 12. It can be seen that the simple construction of the stop member 13 provides a positive arrangement whereby the ratchet-engaging portion 12, in moving rearwardly, can come into engagement only with the next rearward tooth of the ratchet wheel and, in moving forwardly, is limited by the stop 19 to a distance of movement after engagement with the tooth of the ratchet wheel which is equal to the distance between adjacent teeth of the ratchet wheel. Hence, the ratchet wheel is advanced by only one tooth during each actuation. This specific movement of the ratchet wheel 5 is achieved despite overtravel in either direction by the arm 1.

While I have shown and described a specific embodiment of my invention, I do not desire my invention to be limited to the particular construction shown and described and I intend, by the appended claims, to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A ratchet operating mechanism comprising a ratchet adapted to be periodically advanced, a ratchet-advancing member arranged to engage the teeth of said ratchet, and a single fixed stop member, said last-named member including a first portion for engaging a tooth of said ratchet for preventing reverse movement thereof and a second portion for being engaged by said ratchet-advancing member to limit the movement thereof in an advancing direction, said first portion being engaged by said ratchet-advancing member during movement in a reverse direction for actuating said ratchet-advancing member away from said

ratchet, said first portion guiding said ratchet-advancing member into engagement with the same tooth engaged by said first portion during movement of said ratchet-advancing member in said advancing direction.

2. A ratchet wheel operating mechanism comprising a ratchet wheel adapted to be periodically rotated, a resilient ratchet wheel rotating member arranged to engage the teeth of said ratchet wheel, and a single fixed stop member, said stop member including a first portion for engaging a tooth of said ratchet wheel to prevent reverse rotation thereof and a second portion for being engaged by said ratchet wheel rotating member to limit the movement thereof in an advancing direction, said ratchet wheel rotating member being adapted for riding up on said first portion and away from said ratchet wheel during movement of said ratchet wheel rotating member in a reverse direction, said ratchet wheel rotating member being guided by said first portion into engagement with the same tooth engaged by said first portion during movement of said ratchet wheel rotating member in said advancing direction.

3. A ratchet operating mechanism comprising a ratchet adapted to be periodically advanced, a resilient ratchet-advancing member arranged to engage the teeth of said ratchet, and a single fixed stop member, said stop member including a first portion for engaging said ratchet to prevent reverse movement thereof and a second portion for being engaged by said ratchet-advancing member to limit the movement thereof in an advancing direction whereby said ratchet is advanced only one tooth during each advancing movement of said ratchet-advancing member, said ratchet-advancing member being adapted for riding upon said first portion and away from said ratchet wheel during reverse movement of said ratchet-advancing member, said ratchet-advancing member being adapted for riding down said first portion during said advancing movement of said ratchet-advancing member for insuring that said ratchet-advancing member engages the tooth engaged by said pawl.

4. A ratchet operating mechanism comprising a ratchet adapted to be periodically advanced, a ratchet-advancing member arranged to engage the teeth of said ratchet, and a single stop member, said stop member including a first portion for engaging said ratchet to prevent reverse movement thereof and a second portion for being engaged by said ratchet-advancing member to limit the movement thereof in an advancing direction, the distance between the ratchet engaging ends of said first portion of said stop member and said ratchet-advancing member when said ratchet-advancing member engages said second portion being substantially equal to the distance between adjacent teeth of said ratchet, said first portion being engaged by said ratchet-advancing member during reverse movement thereof for insuring that said ratchet-advancing member engages the tooth engaged by said first portion.

5. A ratchet operating mechanism comprising a ratchet adapted to be periodically advanced, a stop member including a flat strip, a ratchet-engaging tongue bent from said strip and providing an opening in said strip, said tongue engaging said ratchet to prevent reverse movement thereof, a ratchet-advancing member including a resilient strip having a ratchet-engaging portion extending through said opening, said first-named strip being arranged to engage said resilient strip along the forward edge of said opening whereby said edge provides a stop for limiting forward movement of said ratchet-advancing member.



6. A ratchet operating mechanism comprising a ratchet adapted to be periodically advanced, a stop member including a flat strip, a ratchet-engaging tongue bent from said strip and providing an opening in said strip, said tongue engaging said ratchet to prevent reverse movement thereof, a ratchet-advancing member including a resilient strip having a ratchet-engaging portion extending through said opening, said first-named strip being arranged to engage said resilient strip along the forward edge of said opening whereby said edge provides a stop for limiting forward movement of said ratchet-advancing member, the side edges of said opening being arranged to engage said ratchet-engaging portion to limit sidewise movement of said ratchet-engaging portion whereby lateral movement of said ratchet-engaging portion out of engagement with said ratchet is prevented.

7. A ratchet operating mechanism comprising a ratchet adapted to be periodically advanced, a stop member including a flat strip, a ratchet-engaging tongue bent from said strip and providing an opening in said strip, said tongue engaging said ratchet to prevent reverse movement thereof, a ratchet-advancing member including a resilient strip having a ratchet engaging portion extending through said opening, said first-named strip being arranged to engage said resilient strip along one edge of said opening whereby said edge provides a stop for limiting forward movement of said ratchet-advancing member, the distance between the ratchet engaging ends of said tongue and said ratchet-advancing member when said ratchet-advancing member is engaged with said edge of said opening being substantially equal to the distance between adjacent teeth of said ratchet.

8. A ratchet operating mechanism comprising a ratchet adapted to be periodically advanced, a stop member including a flat strip, a ratchet-engaging tongue bent from said strip and providing an opening in said strip, said tongue engaging said ratchet to prevent reverse movement thereof, and a ratchet-advancing member including a resilient strip having a ratchet-engaging portion extending through said opening, said first-named strip being arranged to engage said resilient strip along one edge of said opening whereby said edge provides a stop for limiting forward movement of said ratchet-advancing member, said tongue being inclined relative to the direction of movement of said ratchet-advancing member whereby any overtravel of said ratchet-advancing member during reverse movement results in said ratchet-engaging portion thereof riding up said tongue, said tongue blocking engagement of said ratchet-advancing member with any tooth of said ratchet except the tooth engaged by said tongue.

9. A ratchet operating mechanism comprising a ratchet adapted to be periodically advanced, a stop member including a flat strip, a ratchet-engaging tongue bent from said strip and providing an opening in said strip, said tongue engaging said ratchet to prevent reverse movement thereof, a ratchet-advancing member including a resilient strip having a ratchet-engaging portion extending through said opening, said first-named strip being arranged to engage said re-

silient strip along one edge of said opening whereby said edge provides a stop for limiting forward movement of said ratchet-advancing member, said tongue being inclined relative to the direction of movement of said ratchet-advancing member whereby any overtravel of said ratchet-advancing member during rearward movement results in said ratchet-engaging portion thereof riding up said tongue, said tongue blocking engagement of said ratchet-advancing member with any tooth of said ratchet except the tooth engaged by said tongue, the distance between lines extending through said edge and through the ratchet-engaging end of said tongue perpendicular to the toothed face of said ratchet being substantially equal to the distance between adjacent teeth of said ratchet.



JOHN B. TUCKER.

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